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STANDING STOCKS OF FISHES IN
SECTIONS OF LITTLE LAST CHANCE
CREEK, PLUMAS COUNTY, 1997

by

Charles J. Brown
Bay-Delta and Special Water Projects Division

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STANDING STOCKS OF FISHES IN SECTIONS OF LITTLE LAST CHANCE CREEK, PLUMAS COUNTY, 1997

INTRODUCTION

The Department of Water Resources (DWR) initiated an instream flow program in 1976 to identify streams that would benefit from flow enhancement and to assess instream values. The Northern District of the DWR selected Little Last Chance Creek below Frenchman Reservoir (Figure 1) as one of the streams to study under this program.

Department of Fish and Game (DFG) biologists studied trout populations in Little Last Chance Creek in late summer or early fall of 1976, 1981, 1986, 1988, and 1991 through 1997. Brown trout (Salmo trutta) was the only game fish caught every year. Sacramento suckers (Catostomus occidentalis) were also caught every year (Brown 1976, Bumpass et al. 1989, Brown 1991, Brown 1992a, Brown 1992b, Brown 1993, Brown 1994, Brown 1995, Brown 1996, Brown 1997). This report documents the results of sampling conducted in 1997.

The purpose of this study is to evaluate the effects of the operation of Frenchman Reservoir on populations of trout in Little Last Chance Creek through the periodic sampling of fish at established stations in that creek. These data may also be used to measure the recovery of trout in Little Last Chance Creek following the rotenone treatment that the DFG conducted in June, 1991 to kill northern pike (Esox lucius) in Frenchman Reservoir (Brown 1992).

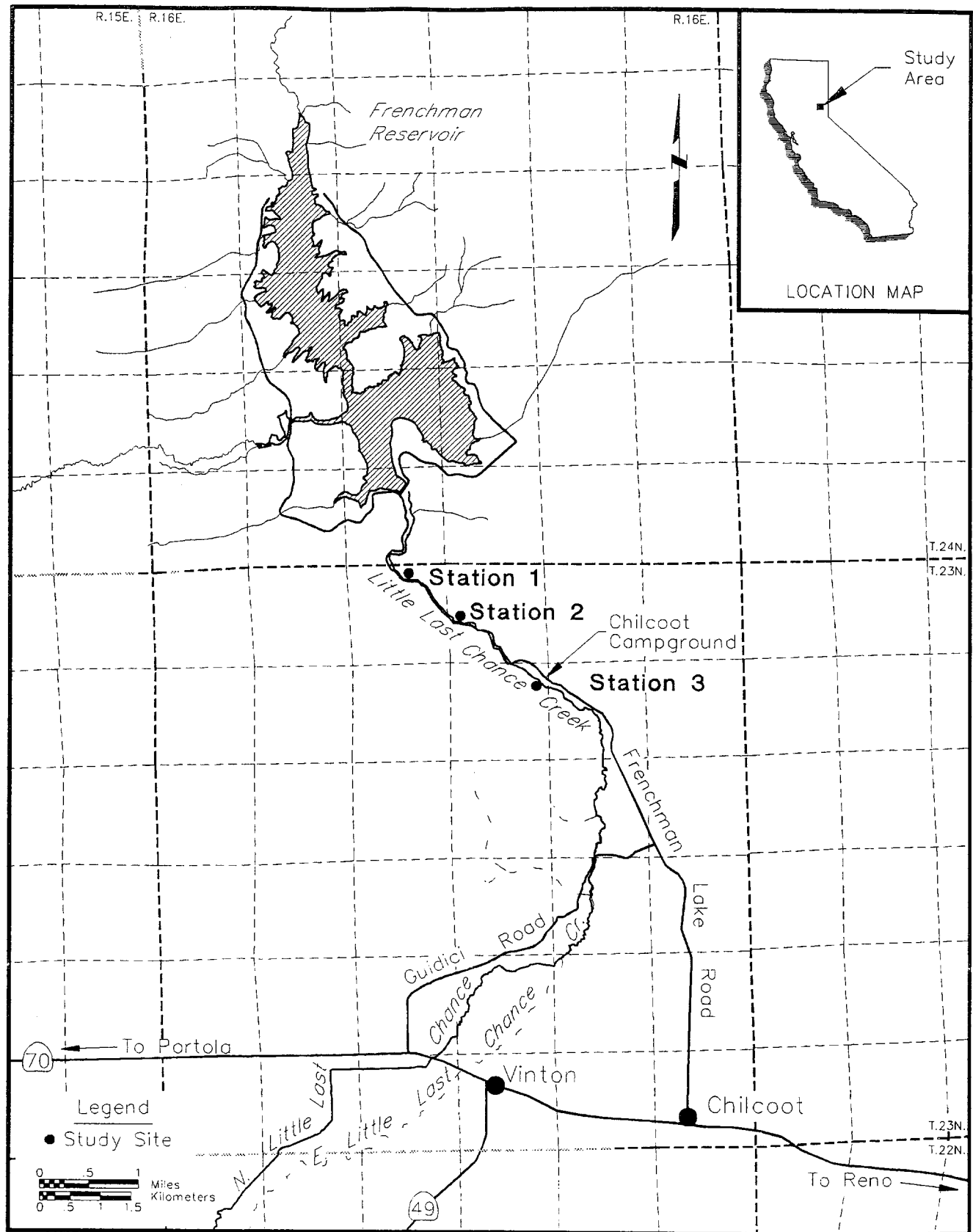


Figure 1. Stations Sampled to Estimate Standing Stocks of Fish in Little Last Chance Creek, Plumas County, 1997.

METHODS

Standing stocks of fishes were estimated at three stations in Little Last Chance Creek in Plumas County in October, 1997. Stations were intentionally selected to be near stations sampled in previous DFG studies (Appendix 1). Markers had previously been placed in trees along the stream to identify station boundaries. Stations varied in length from 47.2 to 50 m. The length and average width of each station was measured. Fish were captured with a battery-powered backpack electroshocker in stream sections blocked by seines. Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates of trout were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weight of each trout was determined by displacement. Fork length (FL) of each fish was measured to the nearest millimeter. Scale samples were taken for trout.

The distribution of fish caught is listed according to location. Standing stocks of brown trout and rainbow trout (Oncorhynchus mykiss) were calculated by station.

RESULTS

Brown trout and rainbow trout were caught in each station. Sacramento suckers were caught in station 3 (Table 1).

Table 1. Fishes caught in selected sections of Little Last Chance Creek, Plumas County, 1997.

	Station Number		
	1	2	3
Distance below Frenchman Reservoir (km)	1.6	3.2	4.4
Brown trout	X	X	X
Rainbow trout	X	X	X
Sacramento sucker			X

Brown trout ranged in size from 80 to 391 mm FL (Figure 2). Brown trout biomass averaged 12.3 g/m² at three stations. An estimated 67 brown trout large enough for anglers to catch and keep (≥ 127 mm FL) were present in the stations that we sampled (Table 2).

Table 2. Estimate of brown trout standing crop in Little Last Chance Creek, Plumas County, 1997.

Distance below Frenchman Dam (km)	Population Estimate	95 % Confidence Interval	Biomass (g/m ²)	Estimate of Catchable Trout (≥ 127 mm FL)	Biomass of Catchable Trout (g/m ²)
1.6	28	15-57	15.4	24	12.9
3.2	18	17-23	9.0	11	8.7
4.4	32	32-40	12.4	32	12.4

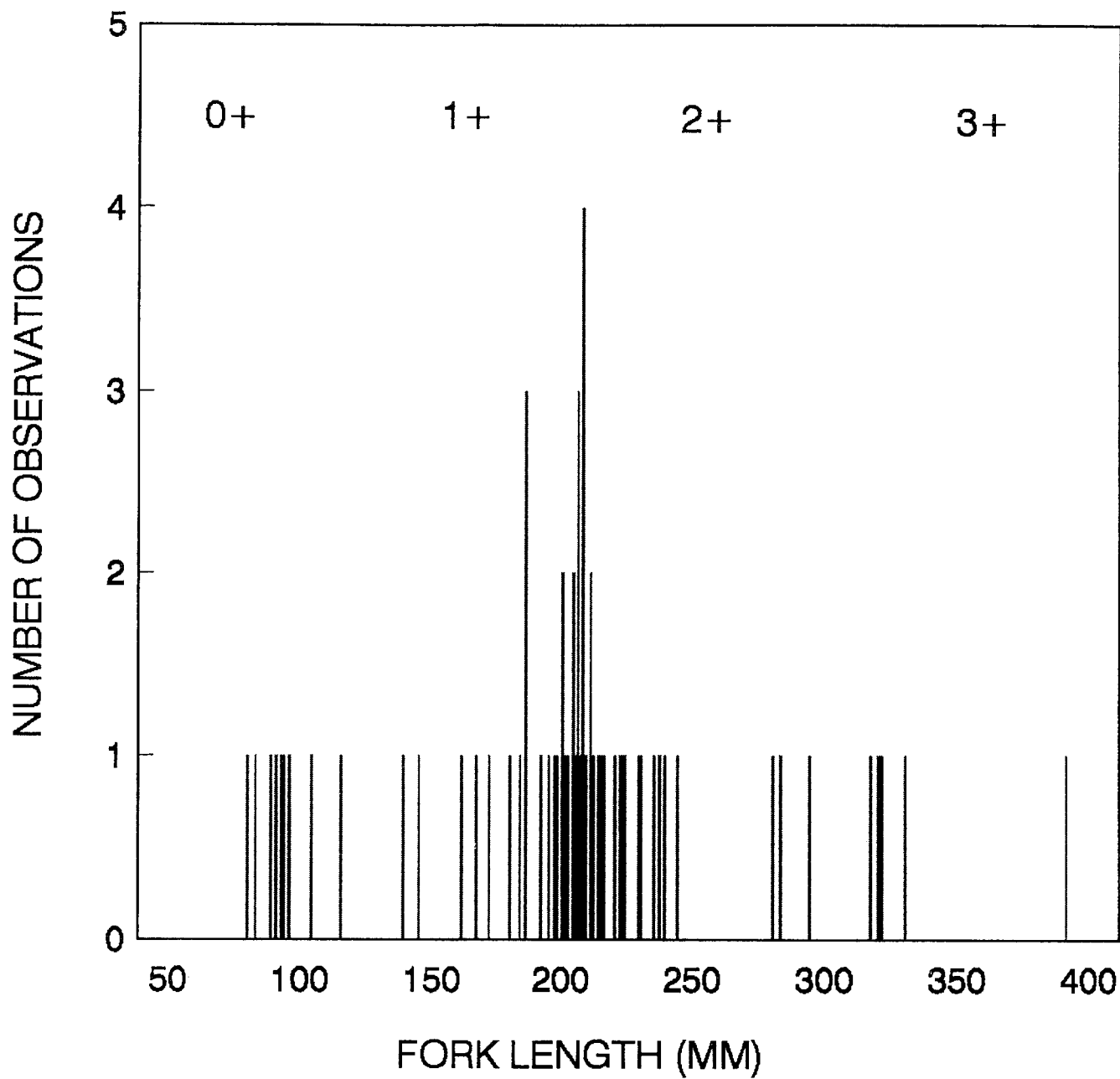


FIGURE 2. Length, observed frequency, and age of brown trout caught in Little Last Chance Creek, Plumas County, 1997.

Rainbow trout ranged in size from 55 to 309 mm FL (Figure 3). Rainbow trout biomass averaged 11.0 g/m² at three stations. An estimated 105 rainbow trout large enough for anglers to catch and keep (≥ 127 mm FL) were present in the stations we sampled (Table 3).

Table 3. Estimate of rainbow trout standing crop in Little Last Chance Creek, Plumas County, 1997.

Distance below Frenchman Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m ²)	Estimate of Catchable Trout (≥ 127 mm FL)	Biomass of Catchable Trout (g/m ²)
1.6	60	43-93	10.4	28	8.3
3.2	113	97-132	18.9	64	17.6
4.4	33	31-39	3.7	13	2.9

The relationship between fork length (FL) and weight (W) of brown trout is:

$$\text{Log}_{10} W = -4.9 + 3.0 \text{ Log}_{10} \text{ FL}$$

$$r^2 = 0.99$$

$$N = 63 \text{ (Figure 4 and Appendix 2)}$$

The relationship between fork length (FL) and weight (W) of rainbow trout is:

$$\text{Log}_{10} W = -4.8 + 2.9 \text{ Log}_{10} \text{ FL}$$

$$r^2 = 0.99$$

$$N = 171 \text{ (Figure 5 and Appendix 3)}$$

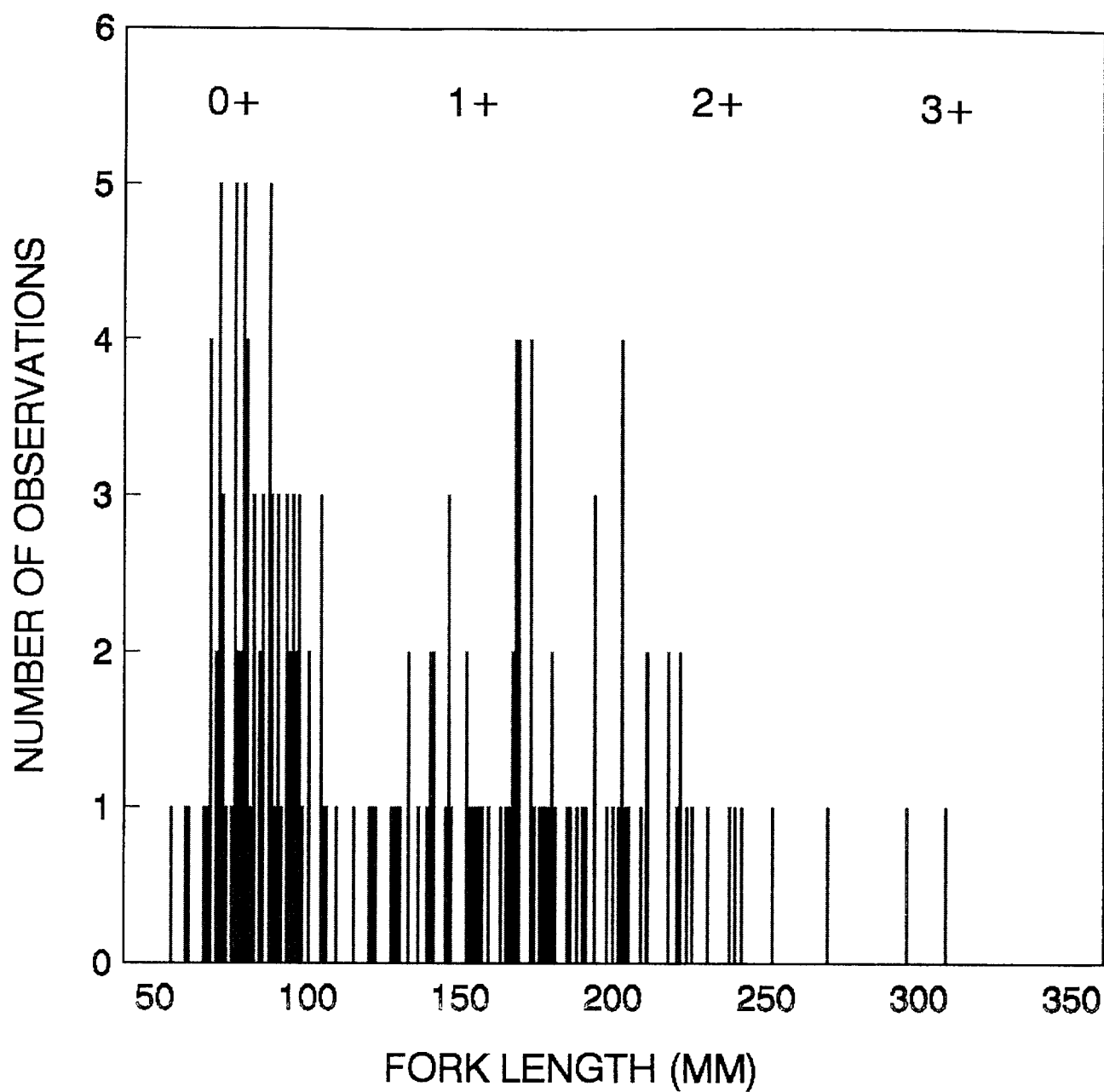


FIGURE 3. Length, observed frequency, and age of rainbow trout caught in Little Last Chance Creek, Plumas County, 1997.

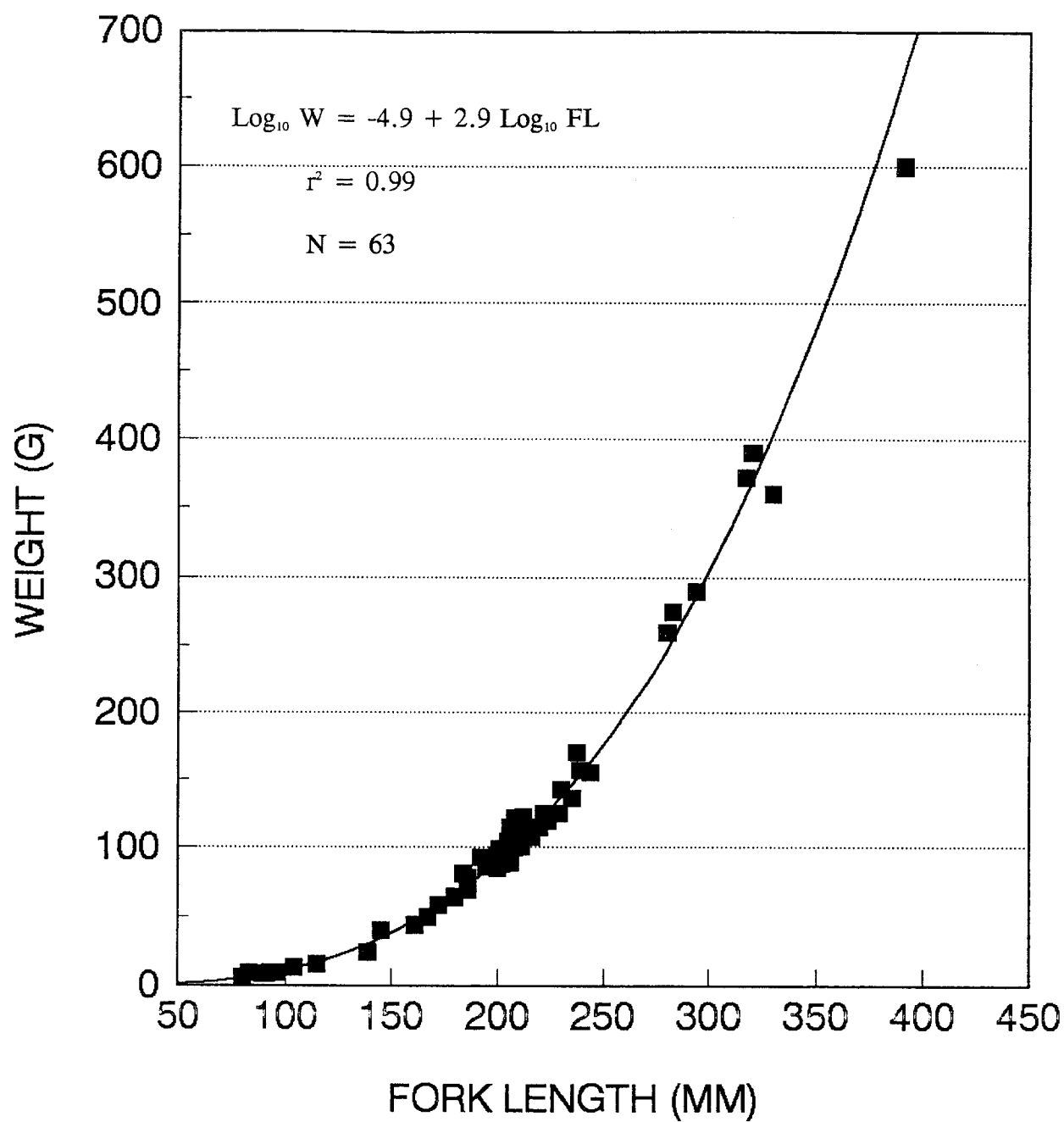


FIGURE 4. The relationship between length and weight of brown trout caught in sections of Little Last Chance Creek, Plumas County, 1997.

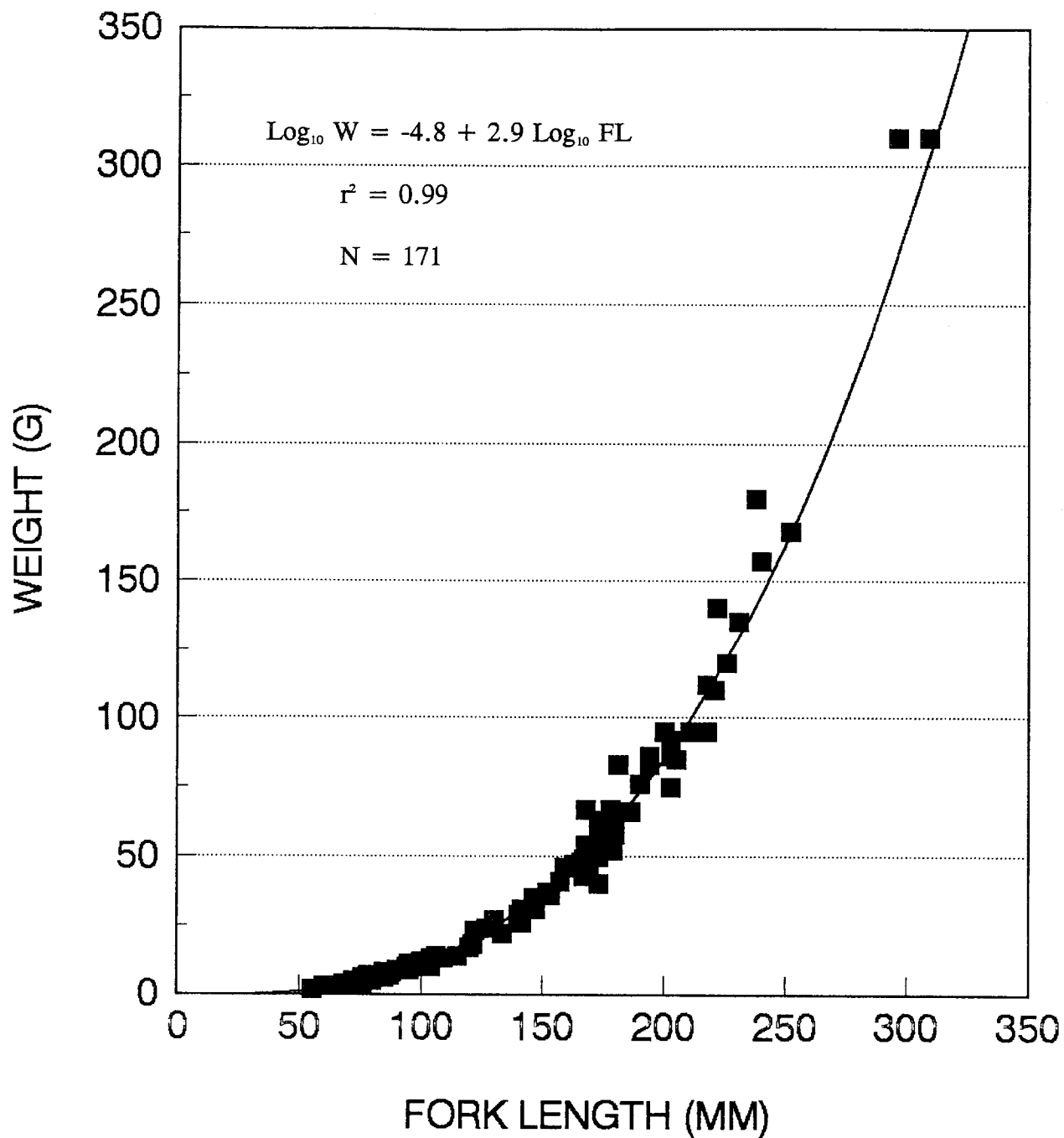


FIGURE 5. The relationship between length and weight of rainbow trout caught in sections of Little Last Chance Creek, Plumas County, 1997.

Age and Growth

The formula $FL = 38.5 + 1.0 S$ describes the relationship between the fork length and enlarged scale radius (S) of 43 brown trout caught in Little Last Chance Creek. The coefficient of correlation (r^2) is 0.78. The formula $FL = 47.5 + 1.1 S$ describes that same relationship for 78 rainbow trout, while the value for r^2 is 0.70.

Population growth and mean individual growth were greater for brown trout than rainbow trout (tables 4 and 5).

Table 4. Growth rates for brown trout caught in Little Last Chance Creek, 1997.

Age	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	91-190	0.736	2.208	97-190	0.672	2.017
2-3	190-303	0.467	1.400	194-303	0.446	1.338

Table 5. Growth rates for rainbow trout caught in Little Last Chance Creek, 1997.

Age	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	88-185	0.743	2.229	92-185	0.699	2.096
2-3	185-280	0.414	1.243	189-280	0.393	1.179

Age 1+ and age 2+ brown trout averaged 169 mm and 215 mm FL, respectively.

Age 3+ brown trout averaged 334 mm FL (Table 6). Age 1+ rainbow trout averaged 156 mm and age 2+ rainbow trout averaged 213 mm FL. Age 3+ rainbow trout averaged 303 mm FL (Table 7).

Table 6. Calculated average fork length of brown trout from Little Last Chance Creek, 1997.

Age	Number of Fish	Length at Capture	<u>Length at Successive Annulus</u>		
			1	2	3
1	12	169	91		
2	28	215	97	190	
3	4	334	96	194	303
Number of back-calculations			44	32	3
Weighted means (mm)			95	191	303
Increments (mm)				96	109

Table 7. Calculated average fork length of rainbow trout from Little Last Chance Creek, 1997.

Age	Number of Fish	Length at Capture	<u>Length at Successive Annulus</u>		
			1	2	3
1	52	156	88		
2	24	213	92	185	
3	2	303	92	189	280
Number of back-calculations			78	26	2
Weighted means (mm)			89	185	280
Increments (mm)				96	95

Coefficient of Condition

The average coefficient of condition for 63 brown trout was 1.1370 (Table 8) and 1.1150 for 124 rainbow trout (Table 9). Brown trout had slightly higher coefficients of condition than rainbow trout.

Table 8. Condition of brown trout in Little Last Chance Creek, Plumas County, 1997.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
0+	8	1.1167	0.8475-1.4820
1+	15	1.1347	0.9075-1.3618
2+	34	1.1355	0.9699-1.3012
3+	6	1.1140	1.9571-1.12708
Combined	63	1.1370	0.9301-1.3438

Table 9. Condition of rainbow trout in Little Last Chance Creek, Plumas County, 1997.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
0+	63	1.1585	0.9254-1.3911
1+	40	1.0602	0.8177-1.3026
2+	19	1.0861	0.8769-1.2954
3+	2	1.1230	0.9813-1.2647
Combined	124	1.1150	0.8672-1.3628

DISCUSSION

Populations of rainbow and brown trout have been increasing as a result of trout that the DFG planted (Table 10). Rainbow trout populations are also increasing because Frenchman Reservoir has spilled in the winter and spring. Rainbow trout migrate downstream over the spillway into Little Last Chance Creek during spills. Few brown trout migrate during spills. Brown trout population estimates before treatment averaged 5 trout while after treatment averaged 21 trout. Biomass averaged 2.9 g/m² before treatment and 9.3 g/m² after treatment. Rainbow trout population estimates averaged 42 trout before treatment and 15 trout after. Biomass averaged 3.7 g/m² before treatment and 2.4 g/m² after (Table 11).

Table 10. Records of trout planting in Little Last Chance Creek following initial treatment with rotenone in June, 1991.

Year	Rainbow Trout		Brown Trout	
	Catchable	Fingerling	Catchable	Fingerling
1991	500	0	1,300	0
1992	1,000	0	0	0
1993	1,540	0	0	3,000
1994	0	0	0	5,240
1995	0	0	1,250	0
1996	0	0	0	3,000
1997	0	1,500	0	1,631

Table 11. Average standing crop and biomass for brown and rainbow trout in Little Last Chance Creek, 1976-1997.

Year	Brown trout		Rainbow Trout	
	Population Estimate	Biomass (g/m ²)	Population Estimate	Biomass (g/m ²)
Before Treatment				
1976	1	0.5	10	3.6
1981	6	2.7	17	4.0
1986	10	3.7	96	3.6
1988	20	4.7	43	3.7
Average	5	2.9	42	3.7
After Treatment				
1991	1	0.2	0	0
1992	4	0.1	1	0.1
1993	11	1.1	0	0
1994	27	10.6	0	0
1995	34	26.2	1	0.1
1996	41	14.9	41	3.6
1997	27	12.3	63	12.7
Average	21	9.3	15	2.4

Some of the trout we caught each year were planted by the DFG. The DFG planted trout in the summer of 1991 and spring and summer of 1992 through 1997. The DFG planted catchable rainbow trout in 1991, 1992, and 1993. Catchable brown trout were planted in 1991 and 1995. Twenty brown trout broodstock were also planted in 1991. Fingerling brown trout were planted in 1993, 1994, 1996, and 1997 (Table 10) (Ron DeCoto, Fishery Biologist, DFG, personal communication). In some cases (such as when trout were about 100 mm FL) we could not distinguish between planted trout and trout that

had hatched in the stream. As a result, we included all the trout we caught in Table 11.

Trout populations have largely recovered in Little Last Chance Creek from the treatment of rotenone that was used to kill northern pike in June, 1991. The DFG killed northern pike in this watershed to prevent them from migrating downstream into the Sacramento River and Sacramento-San Joaquin Delta. The DFG feels that pike could become established in the Sacramento River and become significant predators on juvenile salmonids (Brown 1992).

We caught eight large brown trout (280-391 mm FL) that were nearly ripe. They probably spawned in October or November. We have observed that spawning gravel is concentrated above station 1 (Figure 1). That is where we expect most trout to spawn. We do not know if spawning was successful last year because the age 0+ trout in all stations may have been trout that were planted by the DFG during the summer (Table 10).

While our periodic sampling of trout in Little Last Chance Creek has allowed us to observe the prolonged effects of rotenone on trout populations and their recovery, the main purpose of our study has not changed. We plan to evaluate the effects of the operation of Frenchman Reservoir on trout populations in Little Last Chance Creek in 1998.

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APPENDIX 1

PERMANENT FISH POPULATION STATIONS FOR LITTLE LAST CHANCE CREEK, PLUMAS COUNTY OCTOBER 1997.

Station 1 - Located 1.6 km below Frenchman Dam just downstream from the first bridge at elevation of 1659 m MSL in NW 1/4 of NE 1/4, Section 4, T23N, R16E. This station begins in a riffle beneath the bridge carrying Frenchman Lake Road, then enters a pool with a deeply undercut room-sized boulder on the right bank. The remainder of the station is a short riffle and a shallow pool/run. About 55 percent of the station is pool and 45 percent riffle. Substrate is boulder, rubble, and sand. The station is 47.2 m long with a surface area of 231.3 m² at a flow of 0.4 cms.

Station 2 - Located 3.2 km below Frenchman Dam adjacent to the upper end of a large turnout at an elevation of 1610 m MSL in NW 1/4 of SW 1/4, Section 3, T23N, R16E. This station begins in a large plunge pool followed by two shallow pool/run areas and two short riffles. About 45 percent of the station is pool and 55 percent riffle. Substrate is boulder, rubble, and sand. The station is 49.1 m long with a surface area of 284.8 m² at a flow of 0.4 cms.

Station 3 - Located 4.4 km below Frenchman Dam adjacent to the cutoff road in the center of Chilcoot Campground at an elevation of 1561 m MSL in NE 1/4 of NE 1/4, Section 10, T23N, R16E. This station begins in a steep rapid followed by a long pool with undercut right bank, then a short riffle, a short pool, and finally, another steep riffle. The station is 40 percent pool and 60 percent riffle. Substrate is boulders, rubble, and sand. The station is 50 m long with a surface area of 255 m² at a flow of 0.4 cms.

APPENDIX 2

LENGTH AND WEIGHT OF BROWN TROUT CAUGHT IN LITTLE LAST CHANCE, 1997

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
80	6	186	71	206	91	224	120
83	9	186	78	207	102	229	125
89	8	186	69	208	100	230	143
91	8	192	93	208	122	235	136
93	9	195	86	208	105	237	170
94	9	197	86	208	105	239	157
96	9	198	93	209	105	244	155
104	13	200	94	211	101	280	260
115	15	200	85	211	102	283	275
139	24	201	99	212	123	294	290
145	40	202	88	214	110	317	372
161	44	204	89	215	110	320	390
167	49	204	90	216	108	321	390
172	58	205	105	220	115	330	360
180	64	206	115	222	125	391	600
184	81	206	89	223	120		

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN LITTLE LAST CHANCE, 1997

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
55	2	71	4	78	5	82	7
60	3	71	5	78	7	84	7
61	3	72	5	79	6	84	6
66	3	72	4	79	7	85	8
67	3	72	5	79	6	85	7
68	3	73	4	79	6	85	6
68	4	75	5	79	6	87	7
68	3	76	5	80	6	87	7
68	5	76	5	80	6	87	8
70	4	76	5	80	6	87	7
70	4	76	4	80	5	87	7
71	4	76	6	81	6	88	8
71	4	77	5	82	6	88	8
71	4	77	6	82	7	88	8

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN LITTLE LAST CHANCE, 1997 (Continued)

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
90	9	97	10	121	18	145	31
90	7	97	10	122	23	146	31
90	9	97	11	127	24	146	35
91	9	98	11	128	21	146	32
93	9	100	11	129	24	147	31
93	9	100	12	130	27	152	32
93	10	104	12	133	22	152	37
94	10	104	13	133	24	153	36
94	10	104	10	136	26	154	30
95	11	105	11	139	27	155	34
95	9	106	14	140	29	156	37
95	10	109	13	140	24	157	41
96	10	115	14	141	26	159	46
96	10	120	17	141	31	163	47

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN LITTLE LAST CHANCE, 1997 (Continued)

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
165	46	174	55	198	74	222	140
166	48	176	56	200	95	224	140
167	43	177	60	202	85	226	120
167	49	178	67	203	86	231	135
168	50	179	52	203	75	238	180
168	54	180	58	203	88	240	157
168	67	180	60	203	92	242	160
168	50	181	83	204	100	252	168
169	49	185	65	205	85	270	240
169	56	186	66	209	110	296	310
169	47	188	70	211	95	309	310
169	44	190	76	211	80		
173	40	191	75	218	112		
173	56	194	86	218	95		
173	63	194	80	221	110		
173	50	194	83	222	120		